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RIte Stats

Analysis of RIte Care Utilization Data

Hospital Inpatient Services: NICU

Rhode Island Department of Human Services
Center for Child and Family Health

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Director's Message

In the last issue of **RIte Stats** we provided a broad overview of hospital inpatient services provided in RIte Care. This issue focuses exclusively on a more specific category of inpatient service that is provided in neonatal intensive care units (NICU). Admission rates and total hospital days are trended over time from July 1998 through March 2002. Average length of stay and costs are presented by major diagnosis related group for calendar year 2001, and hospital readmissions during the first year of life are shown for the cohort of infants discharged from the NICU during calendar year 2000.

These results will help inform policymakers on this very important type of care.

Best regards,

Jane A. Hayward, Director
Department of Human Services

Background

Access to and utilization of neonatal intensive care unit (NICU) services have increased dramatically in the United States since the early 1970s, when their impact on infant morbidity and mortality was first recognized. [1] While there are no national standards for what constitutes a 'neonatal intensive care unit', for the purposes of creating a regionalized perinatal system, the American Academy of Pediatrics and American Hospital Association recognize at least three levels of care based on the provision of constant nursing care, continuous cardiopulmonary support, and the capacity to treat very sick infants including those with very low birthweight (< 1,500 g). [2] Obstetric hospitals that do not have specialized care for newborns (i.e., have only normal newborn nurseries) are categorized as Level 1 hospitals. Hospitals with nurseries that are classified as Level 2 (or intermediate care) are able to treat newborns who require between 6-12 hours of nursing time per day while Level 3 facilities require, among other things, more than 12 hours of nursing time per day.

Between 1980 and 1995, the number of hospitals in the United States with NICU beds increased by almost 100% while the total number of NICU beds increased by almost 140%. [2] During the same period of time, the average distance to the nearest hospital with a NICU decreased by 50% (from 33.6 miles in 1980 to 16.6 miles in 1995). [2] The availability of NICU services has had a tremendous impact on reducing infant mortality in the United States. However, some have questioned whether we are making the best use of these very expensive services. [3,4]

The State of Rhode Island's most advanced neonatal intensive care unit is centrally located at Women and Infants Hospital and available to admit infants from all maternity hospitals in the State if necessary.

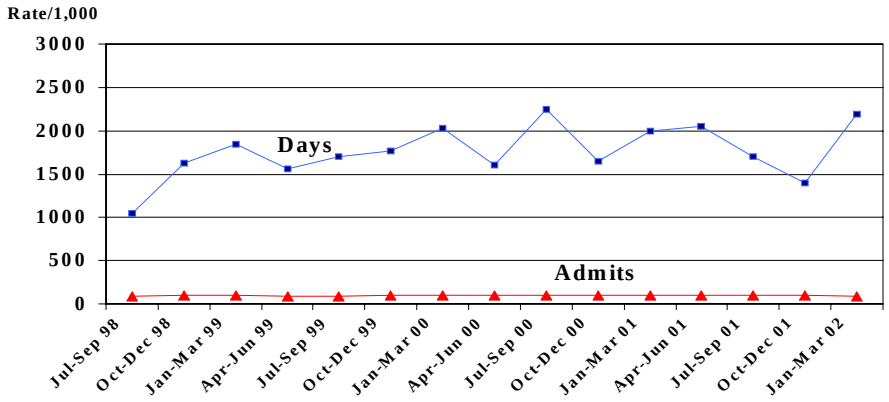
Admission Rates and Total NICU Days

Figure 1 illustrates NICU admission rates per 1,000 live births among RIte Care members by quarter from July-September 1998 through January-March 2002 (the most current period available with complete information). During this time, admission rates varied between 85 and 101 per 1,000 live births with an average quarterly rate of 95 NICU admissions per 1,000 live births within the RIte Care Program which is somewhat lower than the NICU admission rate among infants born at Women & Infants

Hospital. Over the past several years, quarterly NICU admission rates varied from 97 to 139 NICU admissions per 1,000 live births at Women and Infants Hospital. [5]

As Figure 1 also illustrates, total hospital days showed considerably more variation during the same time period, ranging from as low as 960 days per 1,000 live births in July-September 1998 to 2,150 per 1,000 live births during July—September 2000. While several factors contribute to the overall variation in total days, the most important factor was the occurrence of outliers (i.e., the appearance of even a few very long stays, >150 days) which can disproportionately increase the quarterly rate for the entire population. Also affecting the average length length of stay is the dramatic increase in survival among extremely low birthweight infants which has increased from 40% to 85% in recent years. [5] The average length of stay (not shown in chart) varied between 15 and 20 days per admission during the period under study, and averaged 17.5 days across time.

Figure 1. NICU Admissions and Total NICU Days per 1,000 Live Births by Quarter (July 1998 – March 2002)



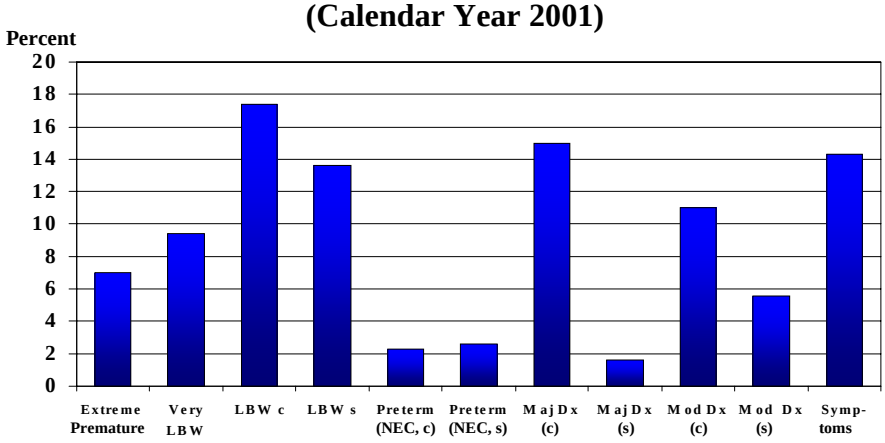
Diagnosis Related Groups

While there is rarely only one reason for an infant to be admitted to the NICU, the New York Department of Health has created a diagnosis related group (DRG) for NICU admissions based on the estimated severity of the diagnoses and symptoms treated. [6] The groupings that appear in Figure 2 represent a modified version of the New York DRG grouper applied to admissions to the NICU among RIte Care members (see Technical Notes).

Extreme prematurity (i.e., birthweights of less than 1,000 grams) are among the most severe cases treated in the NICU and are always considered to include complications in addition to their primary condition. These infants constituted 7.0% of NICU admissions during calendar year 2001, or 30 infants (almost 3 per month). Similarly, very low birthweight infants, those between 1,000 and 1,499 grams, are always considered complicated and constituted 9.4% (40 infants) of all admissions to the NICU. Infants with birthweights between 1500 and 2499 grams (i.e., LBW) can be classified as either complicated or uncomplicated. Complicated LBWs are the most common DRG category treated in the NICU representing 17.4 % of all admissions while uncomplicated LBWs represent 13.6% of all NICU admissions.

The vast majority of infants with a major diagnosis (e.g., respiratory distress syndrome, patent ductus arteriosis, atrial or ventricular septal defect, etc) are classified as complicated and comprised 15% of all admissions, but some (1.6% of all NICU admissions) appeared without other diagnoses or symptoms.

Figure 2. Percentage of NICU Stays by Modified Diagnostic Related Group (Calendar Year 2001)



Note: 'c' = with complications, 's' = without complications.
NEC=Not elsewhere classified
See Technical Notes for category definitions

Moderately severe diagnoses, including cases with respiratory conditions other than respiratory distress syndrome, can occur with or without complications. Most of these diagnoses occur with complications and constitute 11.0% of all NICU admissions, while uncomplicated moderate diagnoses constitute 5.6%.

Finally, there are several other diagnosis related groups shown in Figure 2. Preterm (not elsewhere classified) with or without complications each accounted for a little over 2.0 % of the NICU admissions. These include infants who were born premature, but weighed at least 2,500 grams. The other diagnostic group includes 60 infants who were admitted primarily for observation or to treat symptoms that were not associated with a specific diagnosis. These constituted 14.3 % of all NICU admissions during the calendar year.

Average Length of Stay and Cost

Table 1 illustrates the average length of stay and average costs per admission among the various modified diagnosis related groups discussed in the previous section. It should be noted that the average length of stay for all NICU admissions during the year was 17.5 days and the total amount paid for NICU stays was $13,320,410 (not shown in Table 1).

The average cost and length of stay among infants with birthweights less than 1,500 grams were considerably higher than any other diagnosis related group. Extremely premature infants (birthweights < 1,000 grams) cost an average of almost $151,000 and had an average length of stay of 66.7 days. Other very low birthweight infants averaged 42.4 days with an average cost of $68,920. These two diagnosis related groups constituted 16.4% of all NICU admissions, but represented 50% of all NICU days and 55% of all NICU expenditures.

As a general rule, low birthweight infants had the longest stays of any category including those with major diagnoses with complications. Infants with birthweights between 1,500 and 2,499 grams had an average length of stay of 19.6 days if they had complications and 9.7 without complications. All of the low birthweight categories (except uncomplicated 1,500-2,499 gram infants) had average lengths of stay and average costs greater than infants with major diagnostic conditions with complications.

Infants with a major diagnosis averaged 13 days in the NICU at an average cost of $20,750. Even moderately severe diagnoses with complications averaged 8.3 days and cost about $13,000. It should be noted that infants admitted for observation (symptoms only) averaged just 3 days per admission with an average cost of just under $5,000.

In addition to the impact of birthweight on length of stay and costs, the differences between complicated and uncomplicated cases on these parameters even within the same basic diagnosis related group were noteworthy. For example, uncomplicated low birthweight infants had an average length of stay and average cost that was about half the rate among the complicated low

birthweight infants. Similarly, preterm infants without complications had about half the average length of stay and cost as complicated cases.

Table 1. Average Length of Stay and Costs per Admission by Modified Diagnostic Related Group
(NICU Admissions during Calendar Year 2001)

DRG	Average LOS	Average Cost per Admission
Extreme Prematurity (< 1,000 g)	66.73	$150,840.00
Very Low Birth Weight (1,000-1499 g)	42.45	$68,920.00
Low Birth Weight (1500-2499 g) / Complications	19.61	$31,760.00
Low Birth Weight (1500-2499 g) / Uncomplicated	9.67	$15,830.00
Other Preterm (> 2,500 g) / Complications	11.70	$19,030.00
Other Preterm (> 2,500 g) / Uncomplicated	6.00	$9,360.00
Major Diagnosis / Multiple Symptoms	13.05	$20,750.00
Major Diagnosis / without Multiple Symptoms	7.29	$11,560.00
Moderate Diagnosis / with Serious Symptoms	8.30	$13,020.00
Moderate Diagnosis / without Serious Symptoms	4.50	$6,440.00
Symptoms without Severe Diagnoses	3.08	$4,950.00

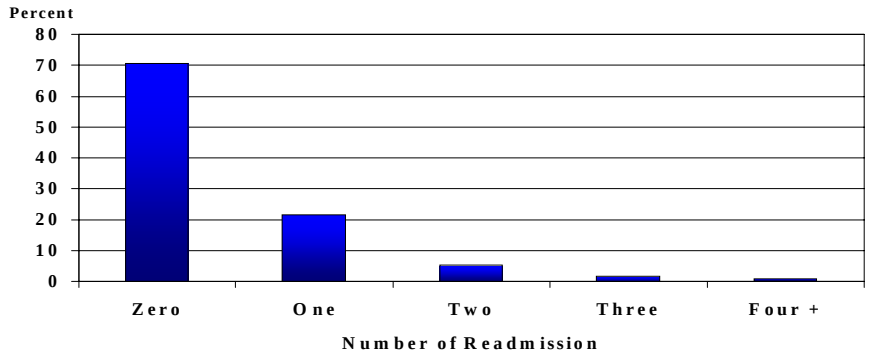
Even among the preterm (NEC) group, complication status had a major impact on length of stay and cost. In almost every case, the complicated group had roughly twice the average length of stay and cost as the uncomplicated group.

Finally, Table 1 offers a reasonably good validity check on the modified DRG grouping presented in this analysis (see Technical Notes for details). The average length of stays and average costs decline with decreasing group severity.

Readmissions

Tracking hospital admissions during the first year of life is an important indicator of overall infant health, and is especially important among infants discharged from the NICU. High readmission rates could be caused by a number of factors including high morbidity among the NICU population, inadequate discharge planning and family education, poor in-house support, or lack of resources in the community to treat sick infants on an outpatient basis. Most infants discharged from the NICU in RIte Care were not readmitted to the hospital during their first year of life (see Figure 3). In fact, 70.7% of the 427 infants discharged from the NICU during calendar year 2000 were not readmitted during the succeeding 12 months. Among the 29.3% who were readmitted, only 11 had more than one readmission.

Figure 3. Infants with an Inpatient Admission within 12 Months of Discharge from NICU.



Note: Based on infants discharged from the NICU during calendar year 2000 and followed for 12 months through calendar year 2001.
n=427 NICU discharges

Comment

Approximately 10% of infants born in RIte Care were treated at a Level 3 neonatal intensive care unit. While admission rates were fairly constant from quarter to quarter, the total number of NICU days varied considerably indicating that some infants require quite lengthy stays (> 100 days). Morbidity related to prematurity and low birthweight were the most common reasons for admissions to NICUs making up almost 50% of all NICU admissions. However, over 15% of NICU admissions were for major diagnostic conditions such as respiratory distress syndrome, patent ductus arteriosis, and other serious conditions. Even within major diagnosis related groups, there was considerable variation in both the average length of stay and average costs between complicated and uncomplicated groups. Approximately 14% of NICU admissions were for observation only, with an average length of stay of 3 days. Most infants discharged from the NICU were not readmitted during their first year of life, while about 30% required from one to six hospital readmissions.

References

1. McCormick MC, Richardson DK. Access to neonatal intensive care. Future of Children 1995;5: 162-175.
2. Howell EM, Richardson DK, Ginsburg P, Foot B. Deregionalization of neonatal intensive care in urban areas. AJPH 2002;92:119-124.
3. Goodman DC, et.al. The relation between the availability of neonatal intensive care and neonatal mortality. NEJM 2002; 346(20):1538-44.
4. Thompson LA, Goodman DC, Little GA. Is more neonatal intensive care always better? Insights from a cross-national comparison of reproductive care. Pediatatrics 2002;109(6): 1036-1043.
5. Personal conversation with Dr. James Padbury, M.D., Pediatrician-in-Chief, Women & Infants Hospital, Providence, RI.
6. All patient diagnosis related group: Patient classification system , version 12.0. State of New York Department of Health and 3M Information Systems. Albany, NY. 1995.

Technical Notes

Since July 1, 1998, most NICU stays for RIte Care enrollees have been paid by the State Medicaid program as part of a carve-out arrangement with the health plans. Woman and Infants Hospital is the only Level 3 neonatal intensive care unit in the state and only infants admitted to that unit are included in this analysis. Length of stay is calculated by subtracting date of admission from date of discharge, except in the case where date of admission is the same as date of discharge in which case length of stay equals one day. Days per quarter are assigned based on date of discharge.

Modified diagnosis related groups (DRGs) were assigned as follows:

1. Birthweight specific diagnoses (i.e., those with an ICD-9 diagnosis 764.xx-765.xx were classified in their respective birthweight group.
2. Distinctions between major and moderate diagnostic severity were less emphatic. The most common major diagnoses were respiratory distress syndrome, atrial septal defect, ventricular septal defect, patent ductus arteriosis, and aneurysm, among others. Diagnoses of moderate severity included respiratory diagnoses other than respiratory distress syndrome, dysrhythmias, jaundice and hypothermia. Either category could occur alone or in conjunction with other symptoms or complications.
3. Infants admitted solely for observation were grouped into the symptoms only category. The most common symptoms followed were rule out sepsis and tachypnea.

Program Description

RIte Care is the State of Rhode Island's managed health care program for families on Medicaid, uninsured families with incomes up to 185% of the Federal Poverty Level (FPL), uninsured pregnant women and children under 19 from families with incomes up to 250% of the FPL. Eligible individuals are enrolled in a managed care organization (Health Plan) which is paid a monthly capitation for providing or arranging health services for members. The

program was designed to improve access to health care by providing each member with a 'medical home' in the form of a primary care provider (PCP).

A comprehensive plan for evaluating RIte Care has been implemented by the Center of Child and Family Health. Health Plans are required to submit data to the State on all services provided to members each quarter. These files are edited extensively and become the foundation for most oversight and monitoring activities. In addition, data are periodically validated against claims and medical records. Other evaluation activities include an annual member satisfaction survey, on-site review of Health Plan policies and procedures, selected focus groups and a variety of health outcomes research.

RIte Stats is a bimonthly publication of the Center for Child and Family Health and is intended to provide information to the public on the health care provided in the RIte Care Program. Comments and inquiries are encouraged and should be sent to:

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